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Making Accessibility Data Accessible – a Challenge

Kathrin Bögelsack
The Norwegian Mapping Authority

Sven Michaelis
The Norwegian Mapping Authority

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Kathrin Bögelsack & Sven Michaelis

The Norwegian Mapping Authority

Kartverket

Correspondence concerning this article should be addressed to Kathrin Bögelsack (Kathrin.Bogelsack@kartverket.no) and Sven Michaelis (Sven.Michaelis@kartverket.no)

1. **Abstract**.

The Norwegian mapping authority has been carrying out a project on mapping accessibility following a national standard since 2009. In the beginning, the mapping was organized and carried out by the Norwegian Mapping Authority. This resulted in the creation of a good basic dataset for many Norwegian districts and bigger **district**-centers and enabled us to develop a national standard. However, it also lead to that the districts often did not feel any responsibility or ownership of the dataset and therefore did not use it in the scope that was intended. As a result, the mapping responsibility was given to the districts in 2015. To kick-start the project, the districts could apply for funding that enabled them to buy the necessary equipment, take part in courses in methodology and cover some expenses for human resources. A further milestone is the development of different possibilities to access and use the data. The goal is to offer as many access ways as possible while taking existing work routines and software use within the districts into consideration. This is an ongoing project and while some access possibilities are already in place and working others are still under development and testing.

Keywords. Accessibility, mapping, survey, Norway, Data access

2. Introduction

The mapping project started in 2009 as a tool to establish the status of accessibility in Norway. The Norwegian Mapping Authority (Kartverket) was commissioned by the responsible ministry to develop a national methodology and carry out the mapping. In the beginning, the data was intended essentially for statistical purposes. However, we soon realized that the data could also be used by the districts in planning processes, for raising funds and awareness and for communicating the topic of accessibility within administration and towards the public. However, as the mapping was carried out centrally through the Norwegian Mapping Authority, the local administrations felt little involvement and were rarely aware of the dataset and it's possible areas of use. We found that informing the districts about the dataset through conferences and our website was not enough to create a sense of ownership. Additionally, if the dataset should survive and be useful in planning processes it has to be kept updated and maintained. On a national scope, that task could only be carried out within the districts. In 2015, we therefore started a new project that had the goal to motivate the local administrations to take mapping and updating in their own hands and integrate the dataset in existing work processes.

3. The Norwegian Accessibility Data

Since the start of the project 911 km walkways and 14558 objects in 171 towns and district centers and 1136 km walkways and 3322 objects in recreational areas in 220 districts have been mapped. The mapped areas are spread throughout Norway and considering that Norway has 422 districts, about half of the Norwegian districts have accessibility data (Figure 1). Objects that are mapped in towns are entrances to mostly public buildings, cultural institutions, sports facilities, transport hubs, HC-parking spots and car parks. In recreational areas, mapped objects

are huts and shelters, beach ramps, fishing spots, picnic spots, benches etc. The method is described comprehensively in Bögelsack & Michaelis, 2016.
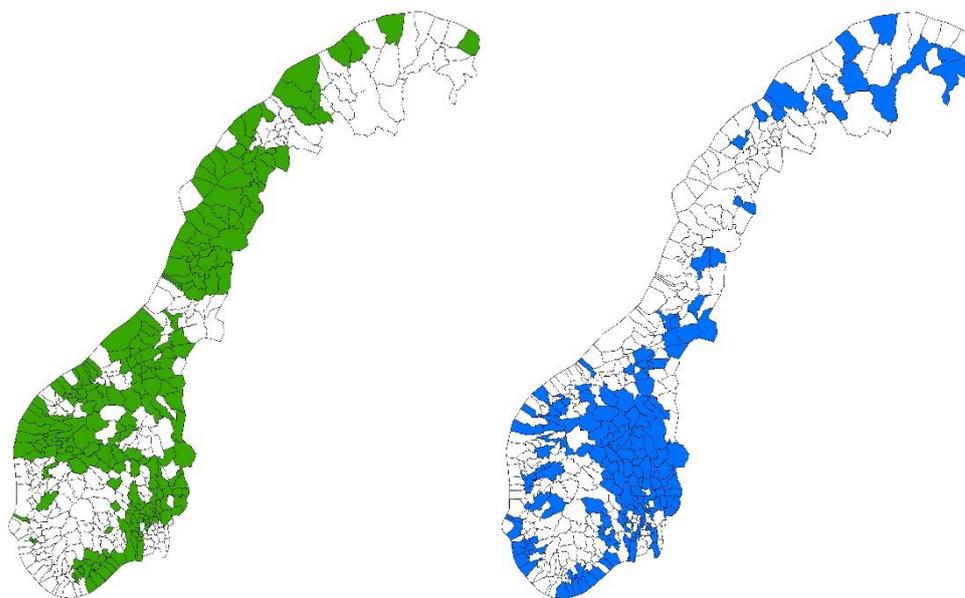

Figure 1: Map of districts with data in the accessibility database from the Norwegian mapping Authority. The map on the left shows data for recreational areas, the map on the right data in district centers and towns.

All data are stored in an administration database, from where they are distributed to different sources of access (Figure 2) through geonorge.no[1], Norwegians national website for map data and other location information. Here users can access a WMS and WFS service, download the data in GML and SOSI (Norway's national data format for spatial data) and comprehensive statistical reports. On geonorge.no users also find a generalized and detailed description of the data, metadata, the UML modell and legends. Additionally, the data are visible through Norgeskart[2], Kartverkets web map client.

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[1] https://kartkatalog.geonorge.no/search?text=Accessibility
[2] http://www.norgeskart.no/#!?project=tilgjengelighet

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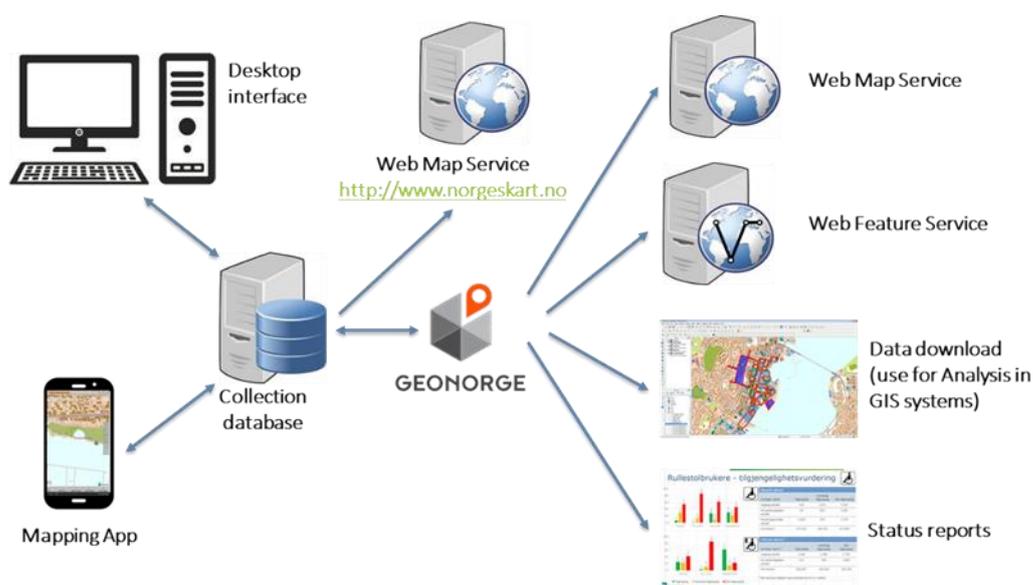

Figure 2: The figure shows a simplified dataflow in the project. The data are being mapped with a field app. From here they ae stored in a server system that delivers the data to all sources of access like WMS, WFS, data dowmnload. Data editing can be done either through importing the data to the field app or downloading them on a desktop computer.

The intended user of the data are primarily district administrations responsible for regional planning or in application for funding. Moreover, the data can be used by superior administrations for setting general guidelines for regional planning and social development and to produce statistics. Interest organisations can also use the data in order to get funding and when having to argue their case in public discussion and hearings.

4. Problem description

Data need to be easily accessible to be used and used to be valued and valued to be maintained.

Norway is divided in counties (fylke) and districts (kommune). Some districts are very remote and rural with very low population density. Many of the remote districts struggle with finding and keeping experienced and well-trained staff. Additionally, even though the topic of Universal Design (UD) is a truly cross-sectional one, it is in practice often just one unit/person within the administration that is assigned to the task and this unit is most often not the planning or IT unit. Besides, even though the interest and motivation is high amongst the people working with UD, the knowledge on spatial data analyses is often rather low. Remote districts sometimes do not even have employees with GIS skills. On the other hand, we dealt with administrations where communication between the units was the main problem; the necessary skill set was present but not readily available or demanded. We are therefore facing a very diverse group of potential data users that have a very wide range of skills concerning the work with spatial data – from non-existent to very high. Common to almost all local administrations is that UD is not a topic with very high priority and funding is sparse. This can have an influence on data quality through lack of updating routines, time invested in learning new skills and setting up standard procedures for integration of data in planning processes.

5. Different ways of access

In order to solve these issues we have started to set-up a project that included support, coursing and software to facilitate the maintenance and use of accessibility-data in local administrations.

The project involves several activities:

- funding the purchase of the necessary equipment and partially the mapping including obligatory one-day courses prior to mapping,

- integrating the data in existing software solutions used for spatial planning by the districts

- making the data accessible for download

- creating reports for download

- developing a desktop solution and set up dataflow that allows mapping in the field as well as in the office

- developing tutorials for working with the data in QGIS

- developing a plug-in for QGIS that allows easy filtering and export of filter results (master thesis in co-operation with the University in Oslo)

- Networking and workshops on data use on several conferences and meetings and active membership of the existing Accessibility Network from the Norwegian Association of Local and Regional Authorities (KS) actively

5.1. Funding and courses

Since 2015 the Norwegian Mapping Authority has been given 1 Mill NoK (ca. 100.000 €) each year by the Ministry of Local Government and Modernization (KMD) to support mapping of accessibility. The funds can be allocated to districts and county administrations as well as to organizations when working together with an administration. The money can be used for buying the necessary equipment, the mapping itself and traveling costs within the project. Before the participants can start the mapping, they have to take part in a free one-day course organized and carried out by the Norwegian Mapping Authorities project team. During these courses basics about the principles of UD and the methodology used is explained, including practical exercises.

All project participants have free access to the app and are given a user name and password that enables them to import and export data from/to the accessibility database. So far, 45 district administration, 8 county administrations and 4 organization have been given funding through that project.

5.2. **Integration into spatial planning software**

Norway has to main providers, Norkart and Norconsult, for spatial planning software, which is used by approx. 90% of all the districts for visualizing, administering and editing their spatial data. We commissioned these two providers for Spatial planning Software to integrate the Web Map Server (WMS) in their object catalogues, which means the WMS can be imported into their software and will be displayed using the right symbology. This way the data can be displayed as background data on which districts can plan building activity, coherent green belts but also events and activities.

5.3. **Data download**

Data can be downloaded for each administrative unit (district, county, Norge) via geonorge.no as GML and SOSI format. This gives the districts the possibility to integrate the data as an editable layer within their Spatial planning software as well as making them applicable with GIS Software like QGIS, ArcGIS, etc.. Some districts used the download options to publish the data on their own website via ArcGISOnline.

5.4. **Creating reports**

The report option provides a comprehensive report that we produce twice a year. These reports are produced for each administrative units (district, county, whole country) and contain information like the history of mapping, amount of objects in each accessibility category, analyses of why objects are inaccessible, diagrams and a map. The reports can be downloaded

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as pptx files via geonorge.no. The reports are produced by connecting an excel file to the collection database via an excel plug-in (Devart, https://www.devart.com/). This way the xls file can be updated to the latest version of the database. The xls file contains formulas that, from the mapped values stored in the database, run several analysis of the data, for example: count the number of public buildings which have an accessible entrance, count the number of HC-parking spots with mapped values for length and width that are above the threshold value etc. and displays them in diagrams and tables. The xls file is, through a VBA script, connected to a pptx template that defines the size and position of text and position of figures. The whole process is not completely automatic and requires some manual work but the work effort necessary is reduced considerably and the output is substantially improved.
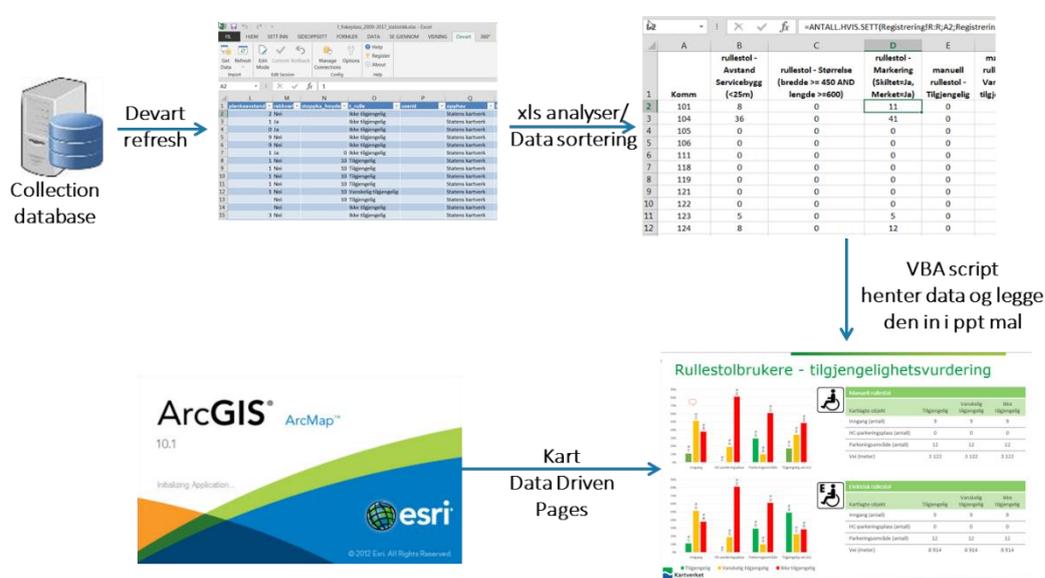

Figure 3. The reports are created by a combination of the database to excel via a plug-in. The calculated results from the excel file are then integrated via a VBA – script into a ppt presentation. The maps are made with the Data Driven Pages function in ArcGIS.

Getting a comprehensive report in a pptx format instead of a pdf gives the user the opportunity to use it completely or just partially for own presentations and adapt the layout in

order to incorporate the required information into their own report routines, websites or other publications.

5.5. Desktop access

Up to now the districts could look at their data on the desktop but for editing they had to use the field app. From this year's mapping period on, it will also be possible to edit the data via a desktop computer. We have set up a spatial data infrastructure that mediates the interaction between inside users/administrators and outside data collectors. Data are constantly synchronized between a system of servers, which can be accessed via your desktop. Districts can download the data, edit them using their spatial planning software and upload them again. Every night the server will synchronize the data. This process is called geo-synchronization. Geo-synchronization defines a national standard for synchronization of geographic information between data systems.

5.6. Tutorials

For many districts as well as county and national authorities, it is important to analyze the data after their spatial features and attributes. A district might have a certain amount of money for upgrading school buildings. First, they need to find out which of the mapped buildings fall into the category "education". Then they need to analyze how many buildings are not accessible. Amongst this selection they can run further analyses on how the entrances comply with the required standards, i.e: Is the door too narrow?, Does the ramp lack a railing? Is the threshold to high?, … . Additionally they can check if the entrances have a HC-parking spot in 50m distance or if the HC-parking spot is the closest of all available parking spots. For all this, they would need GIS software. The most common free and open-source GIS Software is QGIS. Therefore, we set up a user manual on how to import the data into QGIS and run simple analyses.

5.7. **Plug-in for QGIS – a Graphic User Interface (GUI) to accessibility data**

As mentioned in the previous paragraphs, the analysis of the data provides great possibilities for statistics, communication, spatial planning, more efficient use of municipal funds and control and assessment of implemented measures. Since analyses of spatial data can be best carried out with GIS software, a certain knowledge of this software is required. However, since this is not always the case we aimed at providing a tool that could facilitate spatial analyses in GIS software with a minimal knowledge of that software – a graphic user interface (GUI) for the accessibility data analyses. With this project, we will develop such a user interface in cooperation with the users. While the pptx report tool (see 5.4) only answers pre-defined questions, the plug-in allows the users to build their own filters that answer specific questions relevant to them. A geography student at the University of Oslo started the development of the GUI in autumn 2017 as his master thesis. In the beginning of the work, we arranged interviews with five potential users, asking them about their needs, possible user cases, their challenges/ user threshold with the current data organization and their requirements to a tool that would be useful to them. Another set with interviews was carried out towards the end of the development process where our user test group was given a beta version of the app and was asked to "play" with that. Their feedback was used for improving the functionality. The GUI was developed as a plug-in to QGIS. It allows the user to filter the data based on attributes and location and to combine several filters. It provides a map and a table with the filter results that can be exported. More on the development process, the features and the coding can be found in the master thesis Skjeggestad (in prep).
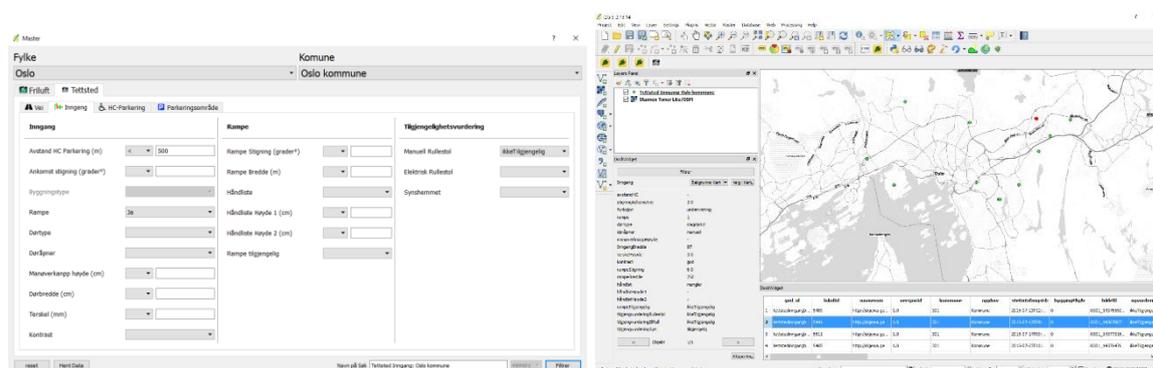
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Figure 4: Screen shot of the user interface of the filter (left) and the filter results (right).

5.8. **Conferences and Networking**

We are part of the national Network for Universal Design, set up by the Norwegian Association of Local and Regional Authorities (KS). We present our project and developments within the project regularly on network meetings. Additionally we speak at other meetings and conferences and take part in different work groups to ensure the integration of accessibility data. Some examples would be:

Folketråkk [3]: The aim of this national project is to gain greater insight into the needs, experiences and preferences of the population. It will provide districts, builders, politicians and other parties involved with a better and more comprehensive knowledge base for the development of cities and towns. The inclusion of accessibility data will ensure that the needs of disabled people are considered early in the planning process.

Merkehåndboka: The Norwegian Trekking association is revising it's handbook for the design of hiking trails. The handbook includes routes for hiking, skiing, cycling and water traffic. The marking of different degrees of accessibility of huts and trails for different user groups is supposed to be included in the handbook.

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[3] https://doga.no/Aktiviteter/folketrakk/

Morotur[4]: This is a local system of walking and skiing trails. The responsible organization has mapped the accessibility for some of their trails. The results will be accessible via an app and their website. The aim is to develop a personalized search system, i.e. the user can define which extent of accessibility he requires.

Geolett: The project is aimed at establishing tools and competence measures that support efficient data flow and integration of priority services in self-service user solutions. The project will also include quality-enhancing measures related to cadastre data, plan register and selected technical data. The accessibility data will be integrated in the system to make sure accessibility is being considered in planning procedures.

6. Conclusion

We now have a system of access possibilities that provide for very different use options and user profiles - from fast simple access via a WMS to data download and advanced data analysis with GIS software. Thus, the accessibility data are comparable to other technical data in Norway like flood and avalanche data, species distribution, road system etc. Nevertheless, we experience that the data are often not used even by districts that map and update their own data. During the interviews conducted in the framework of the GUI development we noticed that the districts were willing to use the data and theoretically saw the value of having them, but did not have a clear picture of what they could actually use them for. Sometimes they simply forget that they actually have those data. In a survey carried out by the Norwegian Directorate for Children, Youth and Family Affairs (Bufdir, 2018) 69% of 100 districts have answered that

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[4] https://mrfylke.no/Morotur/Heim

Universal design is a part of their communal plan. However, even though many districts have integrated the idea of Universal design into their general guidelines, they have not yet set up more specific strategies or have not fully implemented their strategies into standard operating procedures including data analyses/use. This is likely to be an ongoing process and we assume that the situation will improve in the future, probably aided by the fact that students coming from universities today have a higher degree of GIS knowledges than they did 10/20 years ago. Hence, the use of spatial analysis software in administrations without doubt become increasingly common as we have already started seeing a change.

Another major challenge is the funding of Universal Design projects. Each year we get more applications for financial support of mapping within the districts than we have funds for. The application are for both mapping and updating projects. We are aware of the fact that without funding, many district and county administrations and independent organizations would not have the possibility to map accessibility. It also remains to see how many of them will manage to keep the existing data updated. In the last meeting of the network for universal design by the Norwegian Association of Local and Regional Authorities (KS) it became quite clear that many districts could not attend the network meetings unless traveling costs were covered through the network. That shows that funding is a limiting factor in how fast and systematically Universal Design will be integrated in all aspects of communal planning and policy making.

To conclude, we see an improvement towards data use and implementation of accessibility data into practical work processes. Nevertheless, we still need more people with a GIS background involved in the work with Universal Design and funding remains a critical issue when keeping data up to date.

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